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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/784,074

02/20/2004

Kyle K. Kirby

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12/23/2004

WELLS ST. JOHN P.S.

601 W. FIRST AVENUE, SUITE 1300

SPOKANE, WA 99201

EXAMINER

BREWSTER, WILLIAM M

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 12/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No. 10/784,074	Applicant(s) KIRBY ET AL.	
	Examiner William M. Brewster	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>20 February 2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-7, 9-15, 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Palmer, US Publication No. 2004/0201095 A1.

Palmer anticipates a method of fabricating an interconnect for a semiconductor component, comprising:

in fig. 2A, providing a semiconductor component 12,

forming an opening 14 which extends entirely through the component, the opening having sidewalls,

in fig. 2B, depositing a first material 20 along the sidewalls of the opening, the depositing being conducted at a temperature of less than or equal to about 200°C, in p. 3, ¶ 29, Palmer describes the deposition process as low temperature, in p. 3, ¶ 27, Palmer specifies low temperature as being 'preferably about 200°'; and

in fig. 2D, plating a second material 26 within the opening and over the first material, described as plating in fig. 3, p. 4, ¶ 42;

limitations from claim 2 : the method wherein the depositing comprises one or both of ALD and CVD, p. 3, ¶ 28;

limitations from claim 3: the method wherein the depositing comprises one or both of ALD and CVD, and wherein the depositing utilizes multiple cycles which individually form less than or equal to about 10Å of the first material, wherein in a CVD deposition, the entire deposition process may be divided up by the observer to multiple cycles each depositing a certain amount, in this case 10Å layers;

limitations from claims 4, 5: the method of claim 3 wherein the first material is formed to a thickness of at least about 100Å; wherein the first material is formed to a thickness of from about 100Å to about 300Å: TiN in the range of 50Å to 200Å, p. 3, ¶ 28;

limitations from claims 6, 7: the method wherein the component comprises a semiconductor material wafer; wherein substrates for ICs are monocrystalline silicon wafer, p. 3, ¶ 26;

limitations from claims 9-15, the method wherein the first material is an electrically-conductive material; a metal nitride; essentially a metal nitride; essentially one or more of titanium nitride, tungsten nitride, tantalum nitride and hafnium nitride: TiN, TaN, or HfN, p. 3, ¶ 28;

limitations from claim 21: in fig. 1, the method wherein the component comprises a first side and an opposing second side, wherein the opening extends from the

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first side to the second side, the method further comprising forming a conductive material pad, top of 24, over the first side, and wherein the opening is formed through the conductive-material pad.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8, 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Palmer as applied to claims 1-7, 9-15, 21 above, and further in view of Imori et al., US Publication No. 2004/0182714 A1.

Palmer does not specify using activating the first material, but Imori does. Imori teaches, forming a semiconductor component, forming an opening, forming a first material along the sidewalls of the opening, TaN, p. 5, ¶ 54,

limitations from claim 18: the method wherein the first material comprises a metal nitride, TaN, and further comprising activating the metal nitride with one or both of Hf and Pd prior to the electroless plating, p. 5, ¶ 56;

limitations from claim 17: the method wherein the second material comprises nickel, p. 5, ¶ 56;

limitations from claim 16: the method wherein the plating is electroless plating, p. 5, ¶ 56.

Imori gives motivation on p. 1, ¶ 10. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Imori's invention with Palmer's invention would have been beneficial because it solves the problem of inadequate coverage of the seed layer on the sidewalls of vias, which can fail and form gaps.

Claims 22, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Palmer as applied to claims 1-7, 9-15, 21 above, and further in view of Magerlein et al., US Publication No. 2004/0084782 A1.

Palmer does not specify using a solder, but Magerlein does. Magerlein teaches in fig. 2, forming a substrate 30, forming an opening 38 in the structure, depositing a first material along the sidewalls of the opening, TaN, p. 2, ¶ 17,

limitations from claim 23 the method wherein the solder-wetting material comprises electroless deposited nickel 42, p. 2, ¶ 17;

limitations from claim 22: in fig. 3, the method wherein the second material is a solder- wetting material, and further comprising forming solder within the opening and along the solder-wetting material, p. 2, ¶ 20.

Magerlein gives motivation on p. 1, ¶ 7. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Magerlein's invention with Palmer's invention would have been beneficial because it

allows the resulting structure to bond with another structure without providing any special lithographic steps.

Neither Palmer nor Imori specifies the claimed dimensions for claim 8, the maximum length of the opening; claims 19, 20, the thickness of the Hf or Pd layer. However, these dimensions may be optimized by the practitioner.

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art . . . such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality . . . More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ 233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmischer 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising there from. Where patentability is to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William M. Brewster whose telephone number is 571-272-1854. The examiner can normally be reached on Full Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

William M. Brewster

21 December 2004
WB